US009404643B2

(12) **United States Patent**
Clark

(10) **Patent No.: US 9,404,643 B2**
(45) **Date of Patent: Aug. 2, 2016**

(54) **ONE PIECE LED MODULE WITH ROTATABLE FACE**

(71) Applicant: **Juno Manufacturing LLC**, Des Plaines, IL (US)

(72) Inventor: **Stephen Howard Clark**, Downers Grove, IL (US)

(73) Assignee: **Acuity Brands Lighting, Inc.**, Atlanta, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/605,511**

(22) Filed: **Jan. 26, 2015**

(65) **Prior Publication Data**

US 2015/0219296 A1 Aug. 6, 2015

Related U.S. Application Data

(60) Provisional application No. 61/934,966, filed on Feb. 3, 2014.

(51) **Int. Cl.**

F21V 21/30	(2006.01)
F21S 8/02	(2006.01)
F21V 17/16	(2006.01)
F21V 21/04	(2006.01)
F21V 29/503	(2015.01)
F21Y 101/02	(2006.01)

(52) **U.S. Cl.**

CPC ***F21V 21/30*** (2013.01); ***F21S 8/026*** (2013.01); ***F21V 17/164*** (2013.01); ***F21V 21/04*** (2013.01); ***F21V 29/503*** (2015.01); *F21Y 2101/02* (2013.01); *Y10T 29/49947* (2015.01)

(58) **Field of Classification Search**

CPC F21V 21/02; F21V 21/04; F21V 21/14; F21V 21/18; F21V 21/21; F21V 21/30; F21V 29/503; F21V 29/713; F21V 29/74; F21V 29/75; F21V 29/22; F21V 29/2206; F21V 29/2212; F21S 8/02; F21S 8/022; F21S 8/024; F21S 8/026; F21Y 2101/02

USPC 362/249.01, 249.02, 249.07, 269, 285, 362/287, 288, 294, 364, 365, 373, 402

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,356,540	A *	10/1982	Goralnik	F21S 8/04 362/147
6,632,006	B1 *	10/2003	Rippel	F21S 8/02 362/147
6,655,813	B1 *	12/2003	Ng	F21S 8/02 362/147
7,654,705	B2 *	2/2010	Czech	F21S 8/02 362/147
8,096,670	B2 *	1/2012	Trott	F21S 8/02 362/147
8,348,479	B2	1/2013	Tickner et al.	
8,403,533	B1	3/2013	Paulsel	

* cited by examiner

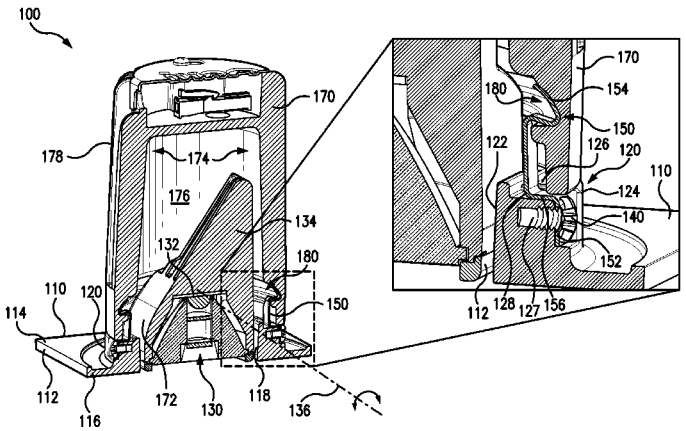
Primary Examiner — Hargobind S Sawhney

(74) *Attorney, Agent, or Firm* — Kilpatrick Townsend & Stockton LLP

(57) **ABSTRACT**

A recessed light fixture, mountable on a wall, includes a trim, heat sink, fasteners and springs. The trim has a trim frame with a trim opening for a light source. The heat sink includes an open end which opens into a cavity to house a portion of the light source, and an interior surface with an interior groove that extends around the interior surface. Each spring has a first end and an opposing second end. The first end of the springs is connected to the trim frame with a fastener. The second end of the springs is inserted through the open end of the heat sink until the second end snaps into and engages the interior groove to connect the heat sink and the trim frame. The second end is movable along the interior groove to allow rotational adjustment of the trim frame relative to the heat sink.

20 Claims, 3 Drawing Sheets



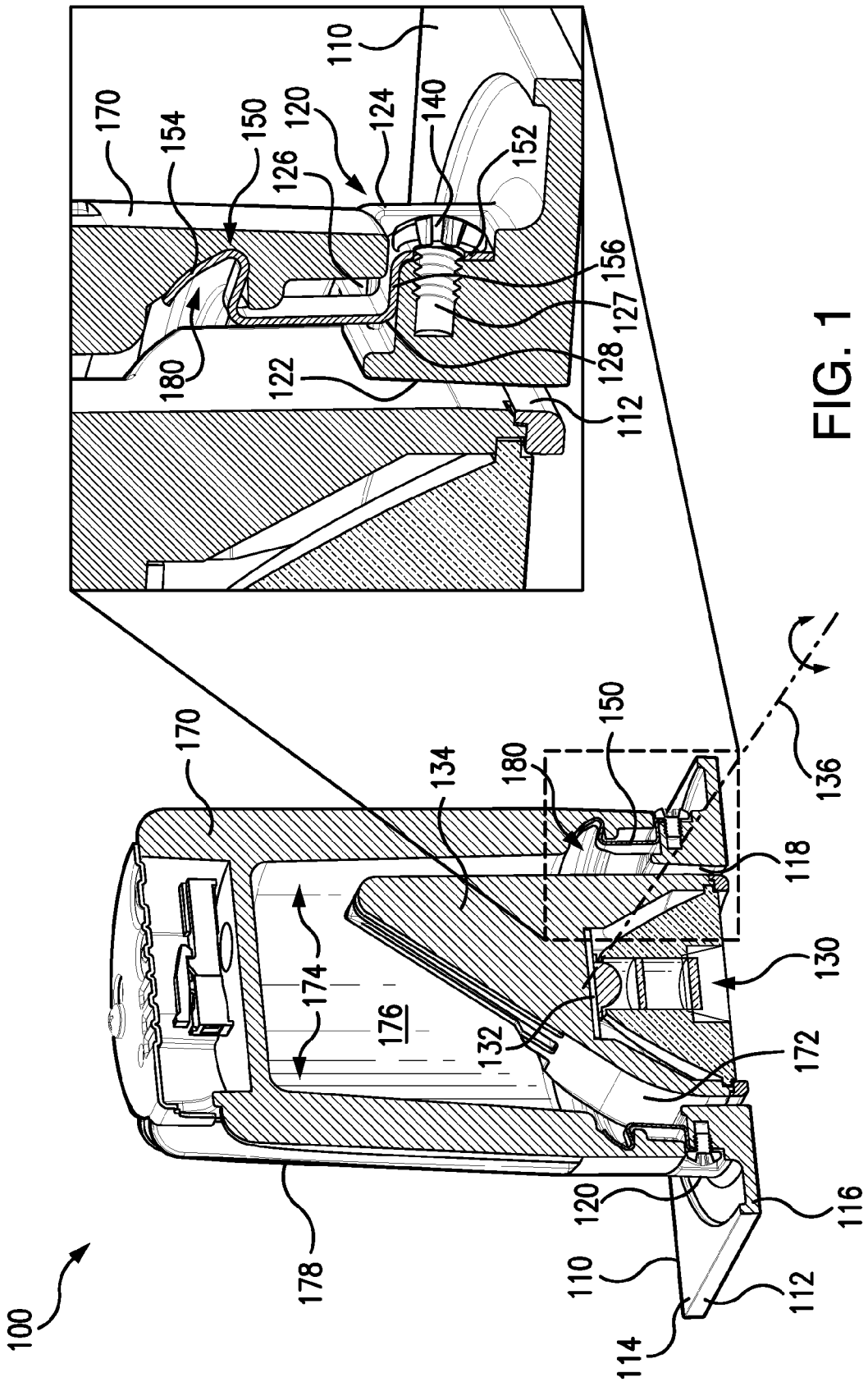

100
110
112
114
116
118
120
122
124
126
127
128
130
132
134
136
140
150
152
154
156
170
172
174
176
178
180

FIG. 1

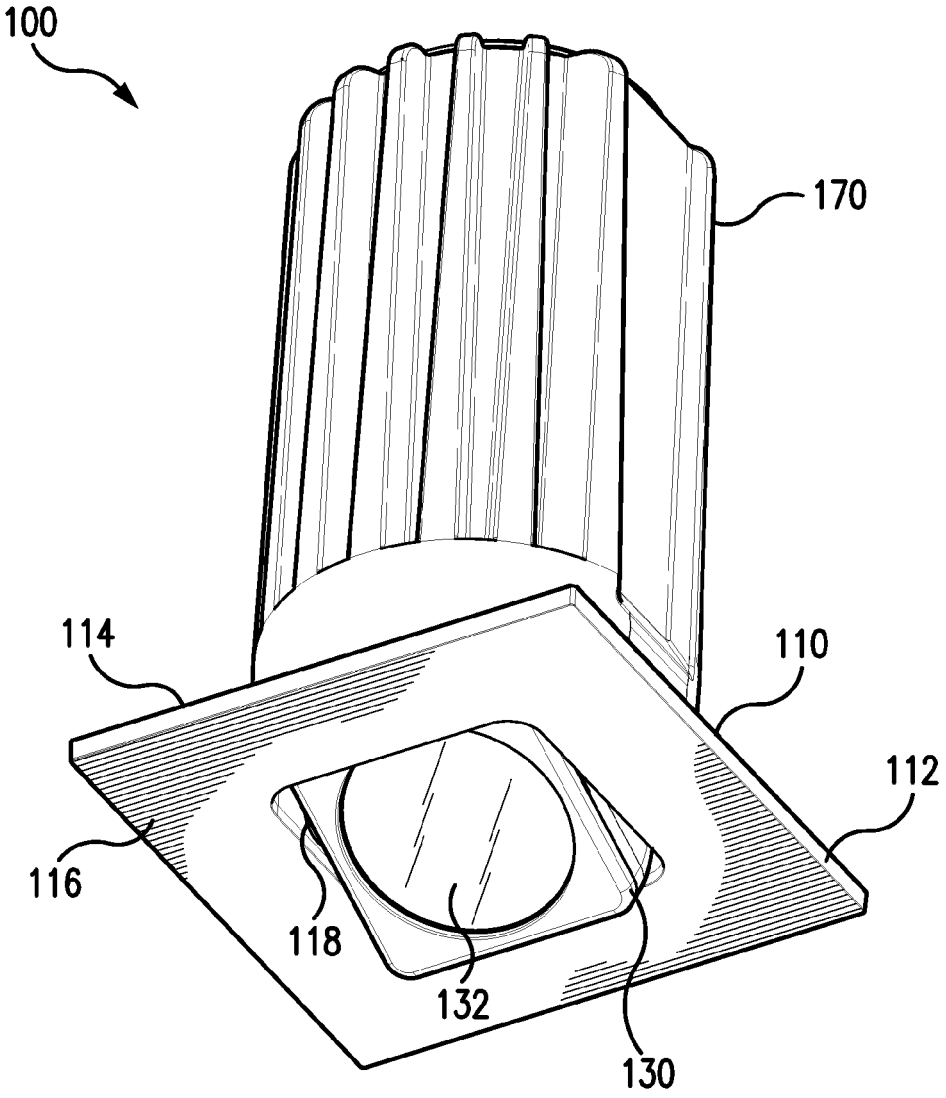


FIG. 2

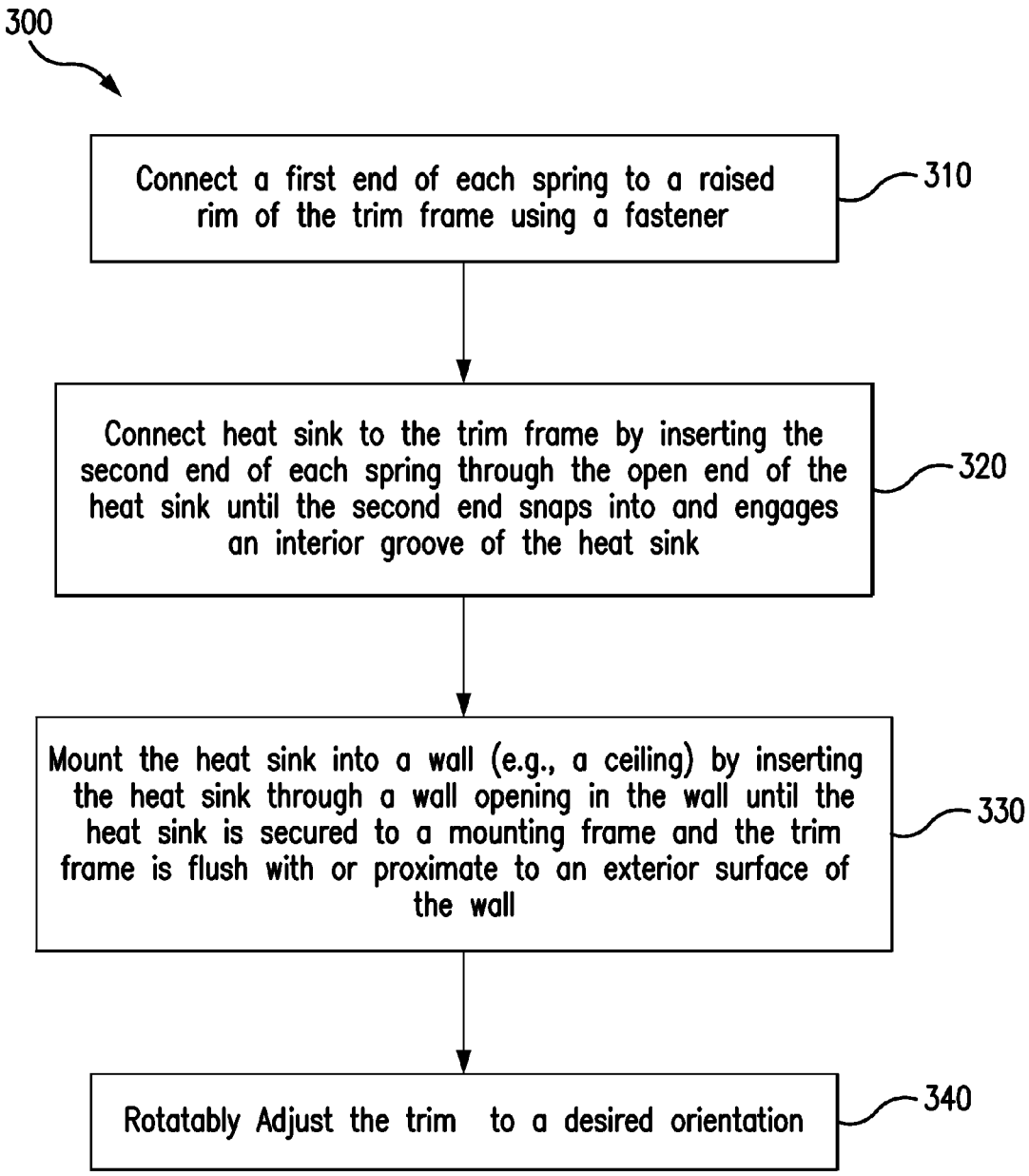

300
Connect a first end of each spring to a raised rim of the trim frame using a fastener
310
Connect heat sink to the trim frame by inserting the second end of each spring through the open end of the heat sink until the second end snaps into and engages an interior groove of the heat sink
320
Mount the heat sink into a wall (e.g., a ceiling) by inserting the heat sink through a wall opening in the wall until the heat sink is secured to a mounting frame and the trim frame is flush with or proximate to an exterior surface of the wall
330
Rotatably Adjust the trim to a desired orientation
340

FIG. 3

ONE PIECE LED MODULE WITH ROTATABLE FACE

RELATED CASES

The present application claims priority under 35 U.S.C. §119(e) based on U.S. Provisional Application Ser. No. 61/934,966 filed on Feb. 3, 2014, which is incorporated by reference herein in its entirety.

FIELD

The present disclosure is related to a recessed light fixture with a rotatable trim.

BACKGROUND

Recessed light fixtures are designed to be minimally visible from below a ceiling, e.g., a ceiling-board, in which they are mounted. LED light sources used for recessed lighting typically generate significant quantities of heat, requiring the use of a heat sink as part of the light fixture, to avoid overheating. The LED light source and an associated reflector, referred to as the optic, are typically mounted in the heat sink, such as a canister, or "can," type housing, so as to project light from the bottom of the heat sink. In some designs, the heat sink may be supported in a mounting frame that is suspended by bar hangers fastened between joists above the ceiling. The mounting frame is positioned so that the bottom of the heat sink passes through a ceiling opening (e.g., a cut out in the ceiling board) and is approximately flush with the bottom, exterior surface (e.g., a room-side surface) of the ceiling. A trim, which includes a trim frame (e.g., a trim ring), can be used to surround the opening in the ceiling, and mask the ceiling opening cut-out.

In some recessed light fixtures, the heat sink and the trim are distinct pieces which are separately assembled and installed onto the ceiling. For example, the heat sink is first installed onto the ceiling. The heat sink can include a lip that extends over edges around the ceiling opening against the bottom of the ceiling. The lip of the heat sink acts as a stop that does not allow the heat sink to continue to be pushed up into the ceiling cavity through the ceiling opening. The trim is thereafter installed onto the ceiling to cover the lip of the heat sink. Accordingly, the installation of these types of a recessed light fixture is complex and time consuming, and can adversely impact cosmetic aspects of the recessed light fixture when installed onto the ceiling. For example, the lip of the heat sink causes the trim to be displaced farther away from the bottom, exterior surface of the ceiling, and may require the use of a trim with sufficient thickness to mask the lip and other components of the heat sink. Further, the trim is not independently rotatable in the canister-type heat sink.

SUMMARY

To address these and other shortcomings, an improved recessed light fixture is provided, which incorporates a simple, yet effective snap-on spring assembly to connect the heat sink and the trim together while allowing rotational adjustment of the trim relative to the heat sink. The heat sink and trim can be mounted in the ceiling as a single unit or module, which simplifies installation. Furthermore, by allowing the trim and heat sink to be assembled into a single unit or module, the improved light fixture eliminates the need for a lip on the heat sink because the trim can act as a stop against the ceiling when mounting the heat sink and the trim onto the ceiling. As a consequence, the trim can be designed to further enhance cosmetic aspects of the recessed light fixture. For example, the trim can be designed with a thinner profile. The trim can also sit closer to the ceiling in comparison to known light fixtures, such as those previously discussed above, which employ a separate heat sink assembly and trim assembly.

An exemplary recessed light fixture can include a trim, heat sink, fasteners and springs. The trim has a trim frame with a trim opening for a light source, such as an LED light module or engine. The heat sink includes an open end which opens into a cavity to house a portion of the lighting source, and an interior surface with an interior groove that extends circumferentially around the interior surface. Each spring has a first end and an opposing second end. The first end of the springs is connected to the trim frame with a fastener such as a bolt or screw. The second end of the springs is inserted through the open end of the heat sink until the second end of the springs snaps into and engages the interior groove to connect the heat sink and the trim frame. The second end is movable along the interior groove to allow rotational adjustment of the trim frame relative to the heat sink. The fasteners can be detached to release the first end of the springs from the trim, which allows disengagement of the trim from the heat sink.

The heat sink along with the trim can be mounted in a ceiling opening of a room using a mounting frame, with the trim frame being flush against or proximate to an exterior surface of the ceiling. The trim frame, which can be rectangular (e.g., square), can thereafter be rotatably adjusted for cosmetic purposes to align the trim frame relative to other aspects in the room, such as the side walls. Furthermore, the adjustability of the trim frame is particularly useful for "wall wash" lighting applications, to align a plurality of wall wash trims or gimbal trims to project light onto a wall surface in a desired fashion.

BRIEF DESCRIPTION OF THE DRAWINGS

The description of the various exemplary embodiments is explained in conjunction with the appended drawings, in which:

FIG. **1** illustrates a cross-sectional view of a recessed light fixture with a rotatable gimbal trim carrying a light source which is adjusted to vertical, in accordance with an exemplary embodiment of the present disclosure.

FIG. **2** illustrates another perspective view of the recessed light fixture of FIG. **1**, with the light source adjusted at an acute angular position.

FIG. **3** is an example flow diagram of a process by which the recessed light fixture of FIG. **1** is assembled, and then mounted and adjusted on a wall.

DETAILED DESCRIPTION OF THE EXAMPLE EMBODIMENTS

The present disclosure is directed to a recessed light fixture with a rotatable trim. The recessed light fixture includes a heat sink (e.g., within or as part of a canister housing) and a trim with a trim frame, which are connected together into a single unit or module using a snap-on spring assembly to allow rotational adjustment of the trim relative to the heat sink. The heat sink and the trim are together mountable onto a wall through a wall opening via a mounting frame. The trim is rotatable to a desired orientation to align the trim with other objects in a room (e.g., room side walls, and other light fixture trims) for cosmetic purposes, or to facilitate wall washing

when using a wall wash trim or gimbal trim. An example of the recessed light fixture is described in greater detail below with reference to the figures.

FIG. **1** illustrates a cross-sectional view of a recessed light fixture **100**, which includes a trim **110**, fastener(s) **140**, spring(s) **150**, and a heat sink **170**. In general, the trim **110** is connected to one end of each of the springs **150** using a respective fastener **140**, such as a bolt or screw. The other end of the springs **150** is inserted through an open end of the heat sink **170** and is snapped into an interior groove in the heat sink **170** to connect the trim **110** to the heat sink **170**. The springs **150** can move along the groove **180** to allow rotational adjustment of the trim **110** relative to the heat sink **170**.

Specifically, in this example, the trim **110** includes a trim frame **112** with a first side **114**, a second side **116** opposite the first side **114**, and a trim opening **118** located in a center of the trim frame. The trim **110** is a gimbal trim, which includes a gimbal **130** with a light source **132**. The gimbal **130** with the light source **132** is arranged in the trim opening **118** to pivot around an axis **136**, which allows rotational adjustment to different angular positions. For example, the light source **130** is adjusted to vertical in FIG. **1**, and is adjusted at an acute angular position in FIG. **2** which illustrates a perspective view of the recessed light fixture **100**.

As further shown in FIG. **1**, the trim frame **112** also includes a continuous raised rim **120** extending around a periphery of the trim opening **118** on the first side **114**. The raised rim **120** includes an inner side surface **122**, an outer side surface **124** opposite the inner side surface **122**, and a top surface **126**. The outer side surface **124** of the raised rim **120** can include a plurality of fastener openings **127**, each of which are configured to receive one of the fasteners **140**, such as a bolt or screw. In this example, a pair of fastener openings **127** is provided on the raised rim **120**, with the fastener openings **127** located on opposite sides of the raised rim **120**. The raised rim **120** also includes a plurality of spring channels **128** on the top surface **126**. Each spring channel **128** is arranged proximate to a respective fastener opening **127**, and extends inwards from the outer side surface **124** toward the inner side surface **122**. The spring channel **128** is configured to provide a pathway for a portion of the spring **150** to extend into the heat sink **170**, when connected to the trim frame **110**. In this example, the trim frame **112** has a rectangular shape (e.g., a square), but can be configured with other shapes.

The heat sink **170** is a canister-style housing, which houses at least a portion of some of the lighting components of the light fixture **100**, such as, for example, the gimbal **130** with the light source **132**, inner heat sink **134**, and so forth. The heat sink **170** includes an open end **172**, which opens into a substantially cylindrical cavity **174** that is defined by an interior surface **176**. The heat sink **170** further includes a groove **180**, which extends circumferentially around the interior surface **176** at a position proximate to the open end **172**. In this example, the groove **180** runs continuously around the interior surface **176**; however, the groove **180** can instead comprise of a plurality of discontinuous grooves for each spring **150**.

Each of the springs **150** includes a first end **152**, and a second end **154** which is opposite the first end **152**. The first end **152** is connectable onto the outer side surface **124** of the raised rim **120**, using a respective fastener **140** which extends through the first end **152** and is secured into one of the fastener openings **127**. In this example, two springs **150** are connected at opposite locations on the raised rim **120**. Between the first and second ends **152** and **154**, there is also a portion **156** which is configured to extend into and through a respective spring channel **128** so that the second end **154** is insertable into the cavity **174** of the heat sink **170**. As shown, the second end **154** of each of the springs **150** extends away from the top surface of the raised rim **120** when the first end **152** of the springs **150** are connected to the raised rim **120**.

To connect the trim **110** to the heat sink **170**, the second end **154** of the springs **150** are inserted into the cavity **174** of the heat sink until they snap into and engage the interior groove **180** of the heat sink. The second end **154** of the springs is movable along the interior groove to allow rotational adjustment of the trim frame relative to the heat sink. The second end **154** can have a male element, which is configured with a shape and dimension to engage the groove **180**, which is a female element. In this example, the second end **154** of the spring **150** has an angular portion that is bent at an acute angle to engage the groove **180**. The interior groove **180** has cross-sectional area, which tapers as the interior groove **180** extends outwards from the interior surface **174** toward and an exterior surface **178** of the heat sink **170**. When engaged in the interior groove **180** of the heat sink **170**, the angular portion of the second end **154** extends into the interior groove **180** of the heat sink **170** to prevent disengagement of the heat sink **170** from the second end **154** of the spring **150**.

As shown in FIG. **1**, the bottom of the open end **172** of the heat sink **170** sits on or adjacent to the top surface **126** of the raised rim **120** to allow access to the fasteners **140**. In this way, the trim **110** and the heat sink **170** can be disconnected by unfastening the fasteners **140** from the fastener openings **127** to release the springs **150**.

FIG. **3** illustrates an example process **300** by which the recessed light fixture **100** is assembled into a single unit or module, and then mounted and adjusted on a wall. For the purposes of explanation, the process **300** will be described in relations to the components of the recessed light fixture **100** in FIGS. **1-2**.

At reference **310**, the first end **152** of each spring **150** is connected to the raised rim **120** of the trim frame **112** using a respective fastener **140**. At reference **320**, the heat sink **170** is connected to the trim frame **112** by inserting the second end **154** of each spring **150** through the open end **172** of the heat sink **170** until the second end **154** snaps into and engages the interior groove **180** of the heat sink **170**. The second end **154** of the springs **150** initially deflect to allow insertion of the second end **154** through the open end **172** of the heat sink **170**.

At reference **330**, the heat sink **170** and the trim **110** is mounted onto a wall (e.g., a ceiling board) by inserting the heat sink **170** through a wall opening in the wall until the heat sink **170** is secured to a mounting frame and the trim frame **112** is flush with or proximate to a room side surface of the wall. Thereafter, at reference **340**, the trim **110** can be rotatably adjusted relative to the heat sink **170** (e.g., the stationary components of the mounted heat sink **170**) to a desired orientation, such as for cosmetic purposes. For example, the trim **110** can be rotated to align the trim frame with other objects in a room (e.g., trims of other light fixtures, walls or other objects) or to orient a direction of a light from the light source **132** against a wall for wall washing purposes which may entail the use of multiple recessed light fixtures **100**.

The recessed light fixture, as described herein, is simply provided as an example of a light fixture with an independently adjustable trim. The spring and the interior groove of the heat sink can be designed with any suitable shape and dimension, to provide for snap-on connection of the trim and the heat sink. The interior groove can be a continuous groove, or can comprise of a plurality of discontinuous grooves on the interior surface of the heat sink for each spring.

Instead of an interior groove, the heat sink can have an exterior groove on the exterior surface. Similar to the interior

groove, the exterior groove can be arranged proximate to the open end of the heat sink and extend circumferentially around the exterior surface of the heat sink. The second end of the spring can be configured to snap into and engage the exterior groove to connect the heat sink and the trim. The spring can move along the exterior groove to allow rotational adjustment of the trim relative to the heat sink.

Furthermore, instead of a groove on the heat sink, the trim can have an interior or exterior groove which extends circumferentially around the interior or exterior surface, respectively, of the trim (e.g., the raised rim of the trim frame). Each spring has a first end fastened to the heat sink via a fastener, and a second end configured to snap into and engage the groove to connect the heat sink and the trim. The spring can move along the groove to allow rotational adjustment of the trim relative to the heat sink.

Words of degree, such as "about", "substantially", and the like are used herein in the sense of "at, or nearly at, when given the manufacturing, design, and material tolerances inherent in the stated circumstances" and are used to prevent the unscrupulous infringer from unfairly taking advantage of the invention disclosure where exact or absolute figures and operational or structural relationships are stated as an aid to understanding the invention.

While particular embodiments and applications of the present disclosure have been illustrated and described, it is to be understood that the present disclosure is not limited to the precise construction and compositions disclosed herein and that various modifications, changes, and variations can be apparent from the foregoing descriptions without departing from the invention.

The invention claimed is:

1. A recessed light fixture, mountable on a wall, comprising:

a trim including a trim frame having a trim opening for a recessed light source;

a heat sink including a cavity to house a portion of the recessed light source, an open end which opens into the cavity, and a groove on a surface of the heat sink;

fasteners; and

springs each having a first end and a second end opposite the first end, the first end being connectable to the trim frame via a respective fastener from the fasteners, the second end to snap into and engage the groove of the heat sink to connect the heat sink to the trim frame, the second end being movable along the groove to allow rotational adjustment of the trim frame relative to the heat sink.

2. The recessed light fixture of claim **1**, wherein the trim frame includes a raised rim extending around a periphery of the trim opening, the first end of each spring being connectable to the raised rim using a respective fastener from the fasteners.

3. The recessed light fixture of claim **2**, wherein the raised rim has an outer side surface, an opposite inner side surface and a top surface, the first end of each spring being connectable to the outer side surface of the raised rim using a respective fastener from the fasteners.

4. The recessed light fixture of clam **3**, wherein the outer side surface of the raised rim includes fastener openings, each of the fastener openings to receive a respective fastener from the fasteners.

5. The recessed light fixture of claim **3**, wherein the raised rim includes spring channels on the top surface which extend inwards from the outer side surface toward the inner side surface, each of the spring channels to receive a portion of the one of the springs between the first end and the second end.

6. The recessed light fixture of claim **5**, wherein the second end of each of the springs extends away from the top surface of the raised rim when the first end of the springs are connected to the rim.

7. The recessed light fixture of claim **1**, wherein the trim frame is rectangular.

8. The recessed light fixture of claim **1**, wherein the cavity of the heat sink is substantially cylindrical.

9. The recessed light fixture of claim **1**, wherein the surface of the heat sink is an interior surface, and the groove is an interior groove on the interior surface.

10. The recessed light fixture of claim **9**, wherein the interior groove extends circumferentially around the interior surface of the heat sink.

11. The recessed light fixture of claim **9**, wherein the interior groove is proximate the open end of the heat sink.

12. The recessed light fixture of claim **9**, wherein the interior groove has a cross-sectional area which tapers as the interior groove extends outwards from the interior surface toward an exterior surface of the heat sink.

13. The recessed light fixture of claim **9**, wherein the second end of the springs includes an angular portion bent at an acute angle which when engaged in the interior groove of the heat sink extends into the interior groove of the heat sink to prevent disengagement of the heat sink from the second end of the spring.

14. The recessed light fixture of claim **9**, wherein the springs are connected to the trim frame, the second end of the springs initially deflecting to allow insertion of the second end through the open end of the heat sink until the second end snaps into and engages the interior groove of the heat sink.

15. The recessed light fixture of claim **14**, wherein each of the fasteners is detachable from the first end of the springs and the trim frame to allow disengagement of the trim frame from the heat sink.

16. The recessed light fixture of claim **1**, wherein the trim further includes a gimbal movably mounted in the trim opening.

17. A method of mounting a recessed light fixture onto a wall comprising:

providing a trim including a trim frame having a trim opening for a recessed light source;

providing a heat sink including a cavity to house a portion of the recessed light source, an open end which opens into the cavity, and an interior surface with an interior groove;

providing fasteners;

providing springs each having a first end and a second end opposite the first end;

connecting the first end of each of the springs to the trim frame via a respective fastener from the fasteners; and

inserting the second end of the springs through the open end of the heat sink until the second end of the springs snaps into and engages an interior groove of the heat sink to connect the heat sink and the trim frame, the second end being movable along the interior groove to allow rotational adjustment of the trim frame relative to the heat sink.

18. The method of claim **17**, further comprising:

mounting the heat sink in a wall opening in the wall with the trim frame being flush with or proximate to an exterior surface of the wall; and

rotatably adjusting the trim frame to a desired orientation.

19. The method of claim **17**, wherein the interior groove extends circumferentially around the interior surface of the heat sink.

20. A recessed light fixture, mountable on a wall, comprising:

a trim including a trim frame having a trim opening for a recessed light source;

a heat sink including a cavity to house a portion of the recessed light source, an open end which opens into the cavity;

fasteners; and

springs each having a first end and a second end opposite the first end, the first end being connectable to one of the trim frame and the heat sink via a respective fastener from the fasteners, the second end to snap into and engage a groove of the other of the trim frame and the heat sink to connect the heat sink to the trim frame, the second end being movable along the groove to allow rotational adjustment of the trim frame relative to the heat sink.

* * * * *